Second Progress Report

For the project entitled:

Inhibitor Longevity and Performance

Reporting Period: April 1, 2008 – June 30, 2008

Prepared by

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and the
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Task 0: Project Management

Weekly meetings were held between team members and the Principal Investigator. As a result of these meetings, experimental design, planning issues, laboratory methods, and items for the field investigation were discussed so that testing could begin in a timely manner, and data evaluated. The project timeline was modified as of the last progress report to reflect the holdup in the contract start date (now January 28, 2008 instead of Oct. 2007).

Task 1: Experimental Design and Planning (80%)

Planning for Task 3.1

Task 3.1 has required planning and coordinating with the product manufacturers and suppliers to ensure receipt of the proper materials according the project specifications. One challenge has been trying to acquire small quantities of deicing products to suit the projects needs. Many of the suppliers work with government agencies where they ship the product using rail, whereas all of our orders only require a half to a full truck for shipment. This has led to some increased product cost because of the mode of transportation and elevated transportation costs.

One deicer vendor provided the product at no cost and we just paid shipping, two deicer vendors provided the product at cost plus shipping, and many other vendors provided the products at government discounted rates plus shipping.

Planning for Task 3.2

Liquid and solid application equipment that would meet the needs of the project has been identified. We will use a liquid applicator with a stream nozzle. The liquid and solid applicators will be mounted on a tow trailer, both of which are designed for agricultural applications. The equipment allows us to apply small quantities (to be specified by the Steering Committee and TAC) of deicer products for the field operational tests, with precision in application rate. Testing of the liquid and solid application equipment will begin in the Summer of 2008 to ensure we can reproduce the application rate and recover the material applied.

Meetings with the project statistician and input from the Steering Committee and TAC members aided in the design of field sampling scheme, which was modified from the original proposal to address issues with sampling liquid and solid deicing products accurately, as well as capturing the small concentration of corrosion inhibitors in the products.

Transcend

- We are working closely with the *Transcend* team at WTI (including Eli Cuelho, Michelle Akin, and Jason Harwood) to ensure the success of this project. The current date for the power, water, building, and snow making equipment to be in place and operational at *Transcend* is December 15, 2008.

- *Transcend* is purchasing four Turbo Crystal semi-automatic mobile snow guns to create storms at the facility.
- The weather station has been set up and has been collecting data since June 20, 2008.

Task 2: Laboratory Investigation (14%)

Task 2.1: Method to Rapidly Quantify Inhibitor Concentrations (30%)

The necessary information has been collected from all deicer manufacturers so that we can duplicate or develop methods to rapidly quantify the inhibitor concentration. The information was secured using non-use, non-disclosure confidentiality agreements between the deicer manufacturer and Montana State University. We are currently using the UV-vis at MSU to determine if inhibitor concentrations are detectable, and if so, whether UV-vis would be the reliable tool to quantify their concentration.

Task 2.2.: Method to Rapidly Quantify Corrosivity of Deicers (10%)

The Standard Operation Procedures (SOPs) for both electrochemical tests and the PNS/NACE gravimetric test have been established at the WTI Corrosion and Sustainable Infrastructure Laboratory. All liquid samples collected to date have been tested using the electrochemical techniques. As liquid and solid samples are collected in the future they will be regularly tested.

Testing with the Corrosion Testing Machine (Ad-Tek, Inc) as specified in the PNS/NACE modified gravimetric test has not begun. The machine was shipped to us with a bent motor and was not reliable in the preliminary testing we conducted. We estimate the machine will be up and running by August 1, 2008.

Task 2.3.: Method to Rapidly Quantify Deicer Performance (5%)

Method development has begun on the DSC and we anticipate beginning to collect data from the field samples in July 2008.

Task 2.4.: Inhibitory Longevity under Laboratory Conditions (4%)

We are currently using the UV-vis at MSU to determine if inhibitor concentrations are detectable, and if so, whether UV-vis would be the reliable tool to quantify their concentration. We have been coordinating with Doug McBroom of MDT to obtain 10 one square ft (2 in thick) asphalt blocks made using the mix design present at *Transcend*. The asphalt blocks will be used to test the application methods, application rates and product recovery in the MSU sub-zero facility. The MSU sub-zero facility will become available in August 2008 and at this time testing will begin.

Task 3: Field Investigation (5%)

Task 3.1.: Inhibitor Longevity: Storage Monitoring (20%)

The six 3000-gallon poly tanks were delivered in November 2007 and the burmed pad that holds them was constructed in February 2008. The tanks have been set up with pumps so that material in three of the tanks can be mixed once a week for one hour. The liquid products (Freezeguard CI plus, Geomelt C, and GLT & NA salt for brine) are in place, as of May 2008, and are mixed weekly for one hour (Figure 1).

Figure 1. Photograph of the six 3000 gallon tanks full of liquid deicers at *Transcend* the Lewistown, MT test facility. Along the center line are the three pumps used to mix one tank of each deicer.

Upon delivery of each deicer product approximately 3 gallons of the liquid product was collected and sent to Ron Wright at Idaho Transportation Department for initial product testing. For the first month samples were collected weekly and brought back to WTI-MSU for Task 2 testing. Following the first month samples are being collected monthly. Approximately one liter of each liquid deicer, mixed and not mixed, is collected during each sampling.

One building was fully constructed by May 2008, while the second building was fully framed but siding was not put up. One challenge we have faced has been that the building manufacturer did not send us the required building siding for both buildings. Currently we are expecting the arrival of the necessary siding in late July 2008. The building manufacturer admitted fault for the incorrect order, but could not expedite the shipment of the necessary metal siding.

Figure 2. Photograph of the 10% salt-sand mixture inside the storage facility at Transcend.

We received the salt-sand mixture with 10% salt by weight July 2008. Approximately 33 tons of the product was split between the outside sloped pad and inside the complete building (Figures 2 & 3). Upon delivery a sample of the salt-sand mixture was collected and will be sent to Ron Wright for initial product testing. Samples were also collected and brought back to WTI-MSU for Task 2 testing. The modified sampling protocol developed with the TAC will involve collecting a five gallon bucket of solid material (instead of one pound) according to ASTM specifications and running the inhibitor detection test at least 3-5 times. This only deviates from the proposal in the quantity of product that is collected.

Upon completion of the second building the IceSlicer Elite (new formula) will be delivered and distributed between the building and the sloped pad.

Figure 3. Photograph of the 10% salt-sand mixture on the outdoor slope pad.

Task 3.2.: Inhibitor Longevity and Deicer Performance: FOTs

In the 2008-2009 winter season, the field operational testing will be conducted on a 200 x 600 ft pad of 2in overlay asphalt at *Transcend*. The products will be applied on the 600 ft length with sufficient spacing in the 200 ft width to prevent mixing. The four Turbo Crystal snow guns will be used to create the specified storm over this area.

Task 4: Project Reporting

This is the second project quarterly report (the first one was submitted in March 2008). The next progress report will submitted in September 2008.

Summary of Expenditures

Table 1 below summarizes the expenditures on this project through June 30, 2008. $173,728.53 has been spent by June 30, 2008, leaving $47,730.53 for the remainder of the project fiscal year. Please note that the only one product manufacturer provided the product at no-cost plus shipping, while two product manufacturers provided the product at cost plus shipping. All other products were purchased at competitive bid prices.

Table 1: Summary of Expenditures by June 30, 2008 (The Pooled Fund budget for 1/28/08-6/30/08 is $47,730.53 and the rest is funded by the WTI-UTC).

Budget Category	Budget	Spent	Remaining
Labor ($)	$59,509.87	$38,011.96	$21,497.91
Travel	$2,000.00	$3,944.90	-$1,944.90
Operations/Communications	$400.00	$97.71	$302.29
Infrastructure start-up cost	$80,000.00	$79,860.19	$139.81
Contracted Testing Services	$3,500.00	$0.00	$3,500.00
Lewistown Facility Usage	$3,000.00	$0.00	$3,000.00
Corrosion Lab Testing and Other Supplies	$7,000.00	$0.00	$7,000.00
Total Direct Cost	$155,409.87	$121,914.76	$33,495.11
Indirect (42.5%)	$66,049.19	$51,813.77	$14,235.42
Total Cost ($)	$221,459.06	$173,728.53	$47,730.53

Project Schedule Summary

Table 2 details the updated project timeline, in which the duration of each task is shown by months.

Table 2: Updated Project Timeline by Month

		Calendar Year / Month																																							
		2007			2008													2009												2010											
Tasks	***Milestones***	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9					
Task 0. Project Management																																									
Project kickoff*	*Oct-07*																																								
Task 1. Experiment Design and Planning																																									
Task 2. Laboratory Investigation																																									
Task 2.1. Methods to Rapidly Quantify Chloride and Inhibitor Concentrations																																									
Task 2.2. Method to Rapidly Quantify Corrosivity of Deicers																																									
Task 2.3. Method to Rapidly Quantify Deicer Performance																																									
Task 2.4. Inhibitor Longevity under Laboratory Conditions																																									
Task 3. Field Investigation																																									
Task 3.1. Inhibitor Longevity: Storage Monitoring and Cost-Benefit Analysis																																									
Task 3.2. Deicer Performance: Field Application																																									
Task 4. Project Reporting																																									
Quarterly progress reports	*End of each quarter*																																								
Draft final report	*Jul-10*																																								
Final report w/ executive summary	*Sep-10*																																								

The dashed line indicates the official start date of the project, based on when the WSDOT/PNS Pooled Fund funding was received.